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EXHIBIT

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GRAY'S ANATOMY

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palatine velum (*velum palatinum*), is free and hangs like a curtain between the mouth and pharynx.

Hanging from the middle of its posterior border is a small, conical, pendulous process, the **palatine uvula**. Arching laterallyward from the base of the uvula on either side are two curved folds of mucous membrane that contain muscular fibers and are called the **arches or pillars of the fauces** (Fig. 16-42).

The Teeth

16-24) appear at different periods of life. Those of the first set appear in infancy and are called the **deciduous** or **milk teeth**. Those of the second set appear in childhood, persist until old age, and are named **permanent teeth**.

The **deciduous teeth** number 20: four incisors, two canines, and four molars in each jaw. The **permanent teeth** number 32: four incisors, two canines, four premolars, and six molars in each jaw. The **dental formulae** may be represented as shown in Table 16-1.

TABLE 16-1. Dental Formulae

| | Deciduous Teeth | | | | | |
|-----------------|-----------------|------|------|------|------|----------|
| | mol. | can. | in. | in. | can. | mol. |
| Upper jaw . . . | 2 | 1 | 2 | 2 | 1 | 2 |
| Lower jaw . . . | 2 | 1 | 2 | 2 | 1 | 2 |
| | | | | | | Total 20 |
| | Permanent Teeth | | | | | |
| | pr. | pr. | mol. | mol. | can. | in. |
| Upper jaw | 3 | 2 | 1 | 2 | 2 | 1 |
| Lower jaw | 3 | 2 | 1 | 2 | 2 | 1 |
| | | | | | | Total 32 |

GENERAL CHARACTERISTICS

Each tooth consists of three portions: the **crown**, projecting from the gum; the **root**, embedded in the alveolus; and the **neck**, the constricted portion between the crown and root (Fig. 16-24).

The **roots** of the teeth are firmly implanted in depressions within the alveoli; these depressions are lined with **periosteum**, which invests each tooth as far as the neck. At the margins of the alveoli, the periosteum is con-

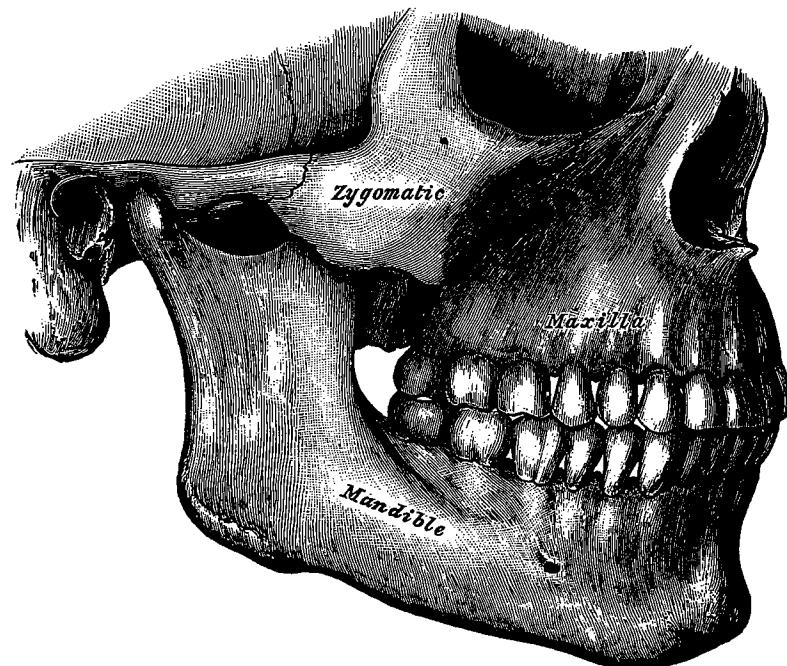


FIG. 16-18. Side view of the teeth and jaws.

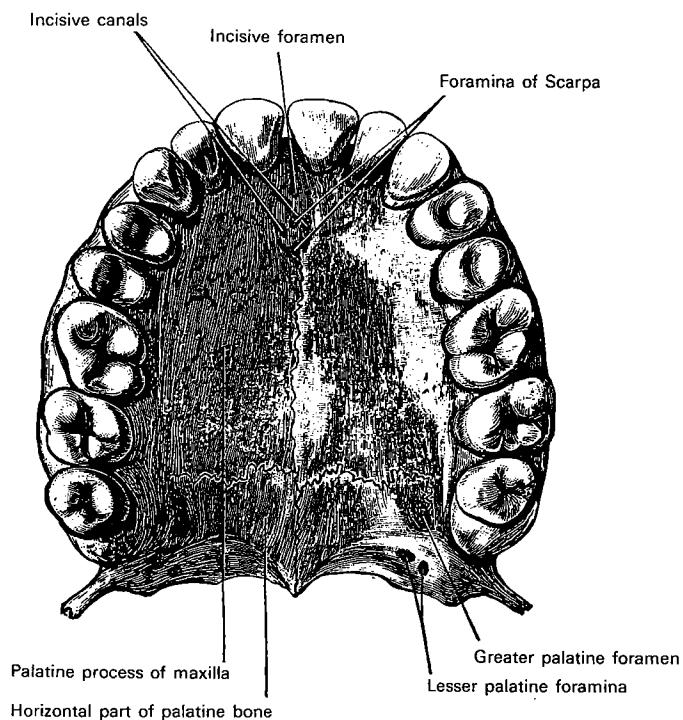


FIG. 16-19. Permanent teeth of upper dental arch, seen from below.

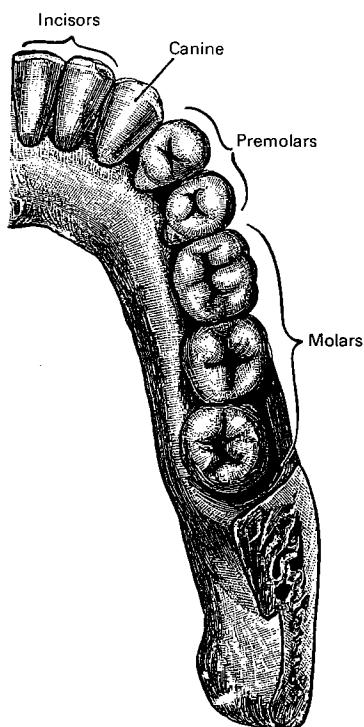


FIG. 16-20. Permanent teeth of right half of lower dental arch, seen from above.

tinuous with the fibrous structure of the gums.

Because of the curve of the dental arch, terms such as anterior and posterior, as applied to the teeth, are misleading and confusing. Special terms are therefore used to indicate the different surfaces of a tooth: the surface directed toward the lips or cheek is known as the **labial or buccal surface**; that directed toward the tongue is described as the **lingual surface**; those that touch neighboring teeth are termed **surfaces of contact**. In the case of the incisor and canine teeth, the surfaces of contact are medial and lateral; in the premolar and molar teeth they are anterior and posterior.

The superior dental arch is larger than the inferior, so that in the normal condition the teeth in the maxillæ slightly overlap those of the mandible both anteriorly and at the sides. Since the upper central incisors are wider than the lower, the other teeth in the upper arch are thrown somewhat posteriorly, and the two sets do not quite correspond to each other when the mouth is closed. Thus the upper canine tooth rests partly on the lower canine and partly on the first premolar, and the cusps of the upper

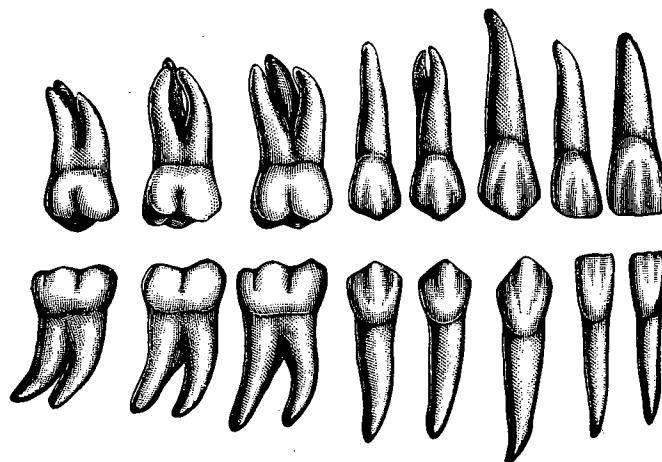


FIG. 16-21. Permanent teeth. Right side. (Burchard.)

molar teeth lie behind the corresponding cusps of the lower molar teeth. The two series, however, end at nearly the same point posteriorly, mainly because the molars in the upper arch are smaller than those in the lower arch.

PERMANENT TEETH (FIGS. 16-20; 16-21)

INCISORS. The incisors are so named for their sharp cutting edge, which is adapted for biting food. There are eight, and they form the four front teeth in each dental arch.

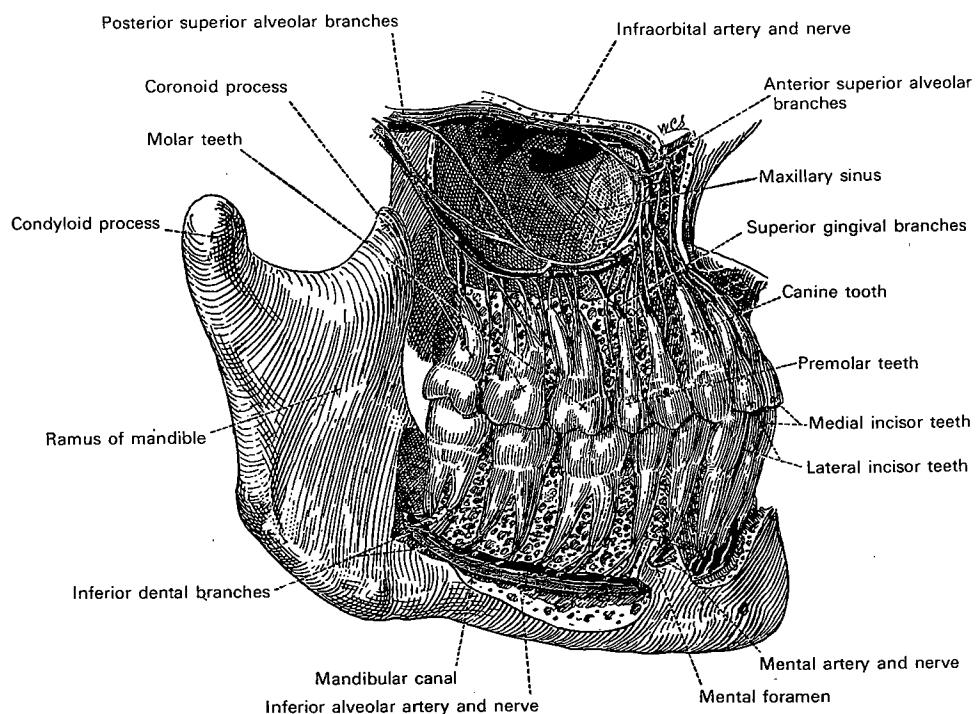


FIG. 16-22. The permanent teeth, viewed from the right. The external layer of bone has been partly removed and the maxillary sinus has been opened to show the blood and nerve supply to the teeth. (Eycleshymer and Jones.)

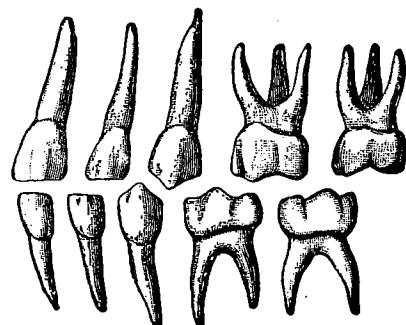


FIG. 16-23. Deciduous teeth. Left side.

The **crown** of each incisor is directed vertically and is chisel-shaped, being bevelled at the expense of its lingual surface, so that it has a sharp horizontal cutting edge, which, before being subjected to attrition, presents three small prominent points separated by

two slight notches. It is convex, smooth, and highly polished on its labial surface and concave on its lingual surface, where, in the teeth of the upper arch, it is frequently marked by an inverted V-shaped eminence situated near the gum. This is known as the **basal ridge** or **cingulum**. The **neck** is constricted. The **root** is long, single, conical, transversely flattened, thicker anteriorly, and slightly grooved on either side in the longitudinal direction.

The **upper incisors** are larger and stronger than the lower and are directed obliquely downward and forward. The central incisors are larger than the lateral incisors and their roots are more rounded.

The **lower incisors** are smaller than the upper; the central ones are smaller than the lateral and are the smallest of all the incisors. They are placed vertically and are somewhat bevelled anteriorly, where they

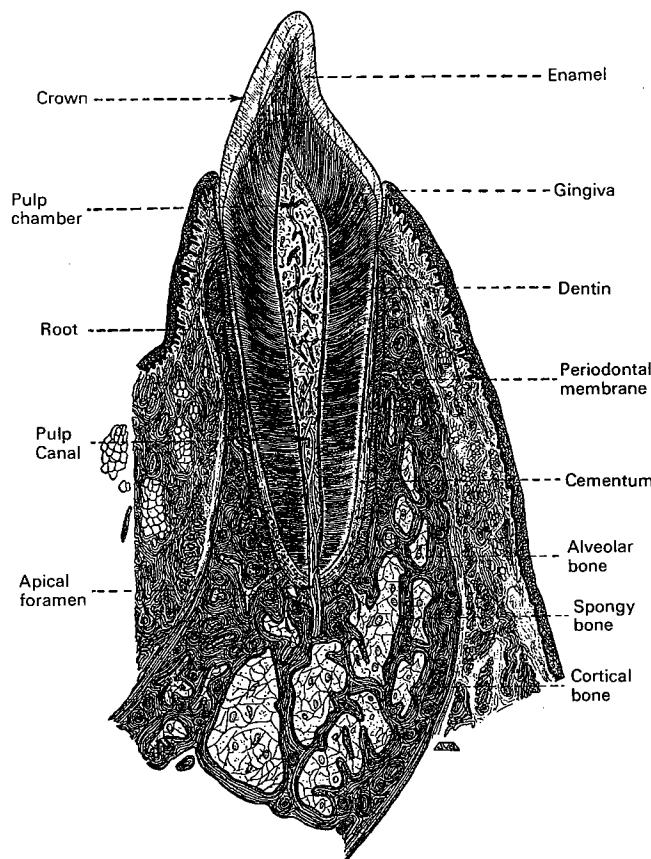


FIG. 16-24. Diagrammatic representation of the dental tissue. (Schour, Noyes' Oral Histology and Embryology.)

have been worn down by contact with the overlapping edge of the upper teeth. The cingulum is absent.

CANINE TEETH. There are four canine teeth: two in the upper and two in the lower arch; one is placed lateral to each lateral incisor. They are larger and stronger than the incisors. Their roots sink deeply into the bones and cause well-marked prominences upon the surface of the alveolar arch.

The **crown** is large and conical, very convex on its labial surface, a little hollowed and uneven on its lingual surface, and tapering to a blunted point or cusp that projects beyond the level of the other teeth. The **root** is single but longer and thicker than that of the incisors. It is conical, compressed laterally, and marked by a slight groove on each side.

The **upper canine teeth** (popularly called eye teeth) are larger and longer than the lower, and usually present a distinct basal ridge.

The **lower canine teeth** (popularly called stomach teeth) are placed nearer the midline than the upper canines, so their summits correspond to the intervals between the upper canines and the lateral incisors.

PREMOLARS. There are eight premolar or **bicuspid** teeth: four in each arch. They are situated lateral and posterior to the canine teeth, and are smaller and shorter than the canine teeth.

The **crown** is compressed anteroposteriorly and is surmounted by two pyramidal eminences or cusps, a labial and a lingual, separated by a groove; hence their name **bicuspid**. Of the two cusps the labial is the larger and more prominent. The **neck** is oval. The **root** is generally single, compressed, and presents a deep groove anteriorly and posteriorly, which indicates a tendency in the root to become double. The apex is generally bifid.

The **upper premolars** are larger and have a greater tendency to form divided roots than the lower premolars; this is especially the case for the first upper premolar.

MOLARS. The molar teeth are the largest of the permanent set, and their broad crowns are adapted for grinding and crushing food. There are 12 molars: six in each arch, three being placed posterior to the second premolars on each side.

The **crown** of each is nearly cubical, con-

vex on its buccal and lingual surfaces, and flat on its surfaces of contact; it is surmounted by four or five tubercles or cusps, which are separated from each other by a cruciate depression. Hence the molars are sometimes called **multicuspids**. The **neck** is distinct, large, and round.

As a rule, the first of the **upper molars** is the largest and the third is the smallest. The crown of the first has usually four tubercles; that of the second, three or four; that of the third, three. Each upper molar has three roots, and of these two are buccal and nearly parallel to each other; the third is lingual and diverges from the others. The roots of the third molar (*dens serotinus* or wisdom tooth) are more or less fused together.

The **lower molars** are larger than the upper. The crown of the first usually has five tubercles; those of the second and third have four or five. Each lower molar has two roots: an anterior, nearly vertical, and a posterior, directed obliquely backward. Both roots are grooved longitudinally, indicating a tendency to divide. The two roots of the third molar (*dens serotinus* or wisdom tooth) are more or less united.

DECIDUOUS TEETH

The deciduous teeth (temporary or milk teeth) (Fig. 16-23) are smaller than, but generally resemble in form, the permanent teeth that bear the same names. The posterior of the two molars is the largest of all the deciduous teeth, and is succeeded by the first molar. The first upper molar has only three cusps—two labial, one lingual; the second upper molar has four cusps. The first lower molar has four cusps; the second lower molar has five. The roots of the deciduous molars are smaller and more divergent than those of the permanent molars, but in other respects bear a strong resemblance to them.

STRUCTURE OF THE TEETH

In a vertical section of a tooth (Figs. 16-24 to 16-26), the **pulp cavity** is seen in the interior of the crown and the center of each root; it opens by a minute orifice at the extremity of the latter. It contains the **dental pulp**, a loose connective tissue richly supplied with

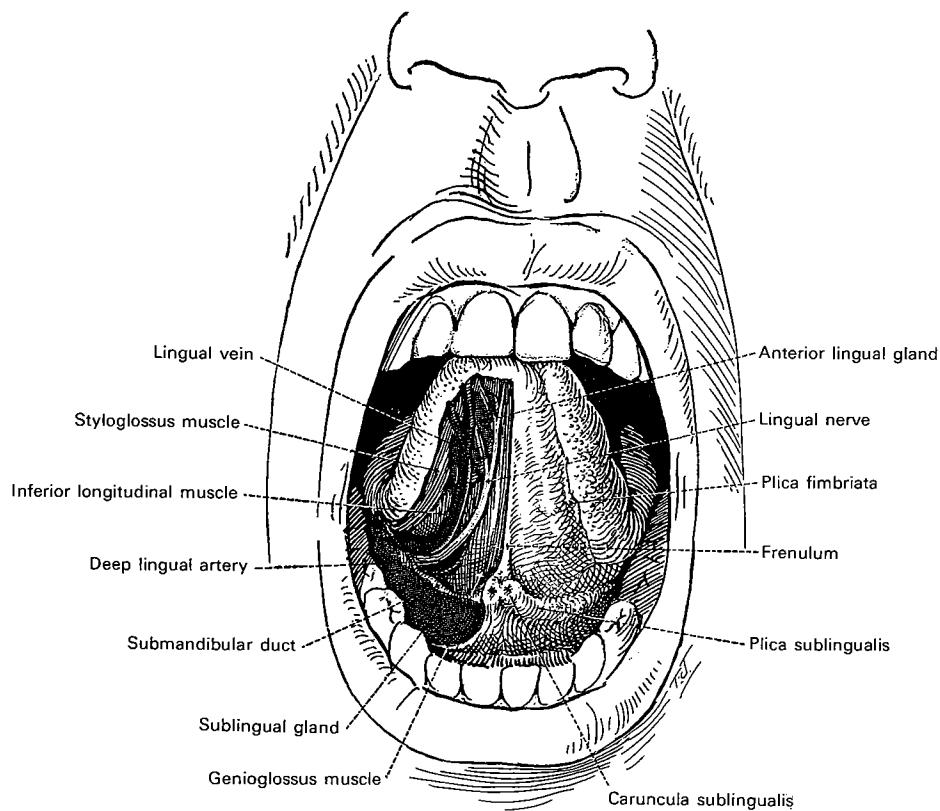


FIG. 16-39. The inferior surface of the tongue, with the right side dissected to show the blood vessels, nerve and salivary gland. (Eycleshymer and Jones.)

at irregular intervals. They occur especially in the sides of the vallate papillae. They are described in Chapter 13 under the Organs of the Senses.

VESSELS AND NERVES. The main artery of the tongue is the lingual branch of the external carotid artery but the facial and ascending pharyngeal arteries also give branches to it. The veins open into the internal jugular vein.

The lymphatics of the tongue have been described on page 882.

The sensory nerves of the tongue are: (1) the lingual branch of the mandibular nerve, which is distributed to the papillae at the anterior part and sides of the tongue, and forms the nerve of ordinary sensibility for its anterior two-thirds; (2) the chorda tympani branch of the facial nerve, which runs in the sheath of the lingual nerve and is generally regarded as the nerve of taste for the anterior two-thirds; this nerve is a continuation of the sensory root of the facial nerve (*nervus intermedius*); (3) the lingual branch of the glossopharyngeal nerve, which is distributed to the mucous membrane at the base and sides of the tongue and to the vallate papillae, and

which supplies both gustatory filaments and fibers of general sensation to this region; (4) the superior laryngeal nerve, which sends some fine branches to the root near the epiglottis.

Salivary Glands

Three pairs of large salivary glands pour their secretion into the mouth; they are the **parotid**, **submandibular**, and **sublingual** (Fig. 16-40).

PAROTID GLAND

The parotid gland, the largest of the three, varies in weight from 14 to 28 gm. It lies upon the side of the face, immediately below and in front of the external ear. The main portion of the gland is superficial, somewhat flat and quadrilateral, and is placed between the ramus of the mandible, the mastoid process, and the sternocleidomastoid muscle. Su-